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MRTS-A SUSTAIBLE TRANSPORT SYSTEM

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Abstract—*Population is increasing with time geometrically which result the expansion of city as well as expansion in related infrastructure like traffic and transport. It is noticed that the mobility strength and mode is increased. So we felt need for a transport system which is able to transport maximum number of passengers in minimum duration of time.*
Mass Rapid Transit System (MRTS) is the solution for this problem. MRTS which may base on rail or bus is appreciable among the world and must be a sustainable transport system.
From 1863 to 2013 the MRTS is increasing with increase in tier of city in the hierarchy. Now 168 cities in 55 countries using this system. In 1863 London use to serve first MRTS, which is rail based, serve between Paddingdon and Farringdon, which used by 80000 passengers in first two days.
This paper consists the history, features and successful life of MRTS such a sustainable transport system.

1. INTRODUCTION

We live in flow city, systems are the roots of design, nourishing the spaces we try to make beautiful, projects in urban design, architecture that aren't made with an understanding of flows & connectivity are destined to fail. Krishna Hill.

Definition of MRTS and Sustainability- mass rapid transit system is a passenger transit system mostly in a urban area where the mass strength of passengers need to go far in minimum time duration. Usually in urban area say class 1 and 2 cities, the migration is increasing regularly results the geometrical growth of population.

Increasing in use of personalized motor vehicle is choking the already congested read. As we know unplanned inefficient transport system disturbs the economic growth & leads different environmental issues.

As sustainability refers the social, economical & environmental components and at the same time transport having contributes all these, a planned transport system is required. MRTS having less impact on environment, safe and secure for society & a great step for economy.

So, the MRTS is a sustainable transport system.

Table 1: Environment Concern on Transit Mode

Modes of Travel	Effects on the Environment
Rail	• Noise and Vibration • Accident Risks and Hazards • Damage to Wildlife and Farmlands • Land requirements for ROW • Depletion of Fossil Fuel
Road	• Air Pollution at a local and Global Level • Noise and Vibration • Accident Risks • Damaged to Wildlife and Farmlands • Land Requirement for Terminals, Workshops, Fuel filling Stations • Pollution for surface water • Depletion of Fossil Fuel • Air Pollution
Air	• Noise • Accident Risks • Congestion of access roads to airport • Air and Sound Pollution
Water/ Marine	• Alteration in natural water system • Ecological disturbance • Water pollution etc

2. NEED FOR MRTS

- Unprecedented Growth of Personal Vehicles- The urban area population of metropolitan is increased by 1.9 times in India during 1981-2001 but the number of motor vehicle is increased by 7.75 times during this tenure.
- Growing Traffic Congestion- The people of urban area felt various traffic problems like accident, congestion and crowding on the road, this is because of increasing population (traveller) and older transport system which is not efficient.
- Time Saving- As we know that the metro rail having faster speed and dedicated corridor as well, so definitely it takes less travel time that of others.
- It can be calculated from the formulae using different parameters like daily run of vehicle, speed in congested traffic and speed in decongested traffic. Here is the final result of a survey of bus and metro :-

Table 2: Time Savings

	Bus	Metro
Daily Passengers Carried (million)	3.3	3.2
Time Saved on Average (hours)	0.21	0.31
Value Of Time per Passengers (Rs.)	5.96	5.96
value of Daily Time Saving (Rs. million)	4.13	5.91

Source- Rites (1995a)

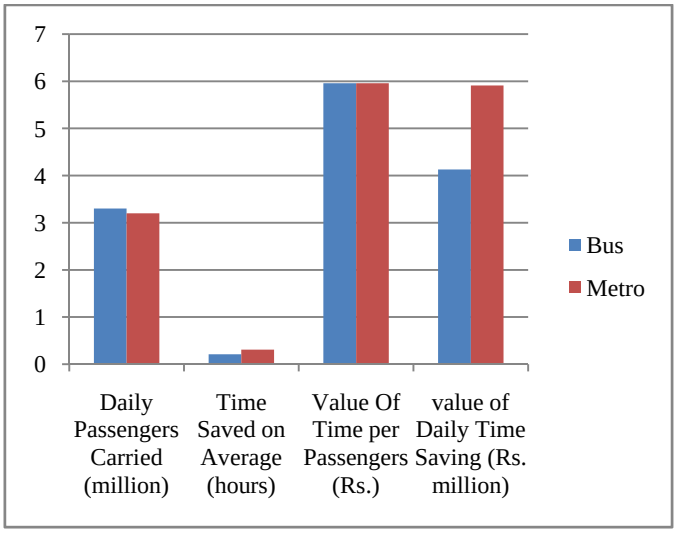

Fig. 1:Value of Time for Passengers

- Traffic accident- As per WHO, 3400 people die on the road every day. In India more than 4 Lakhs accidents noticed every year. After the starting of transportation planning the rate of accident is minimized.

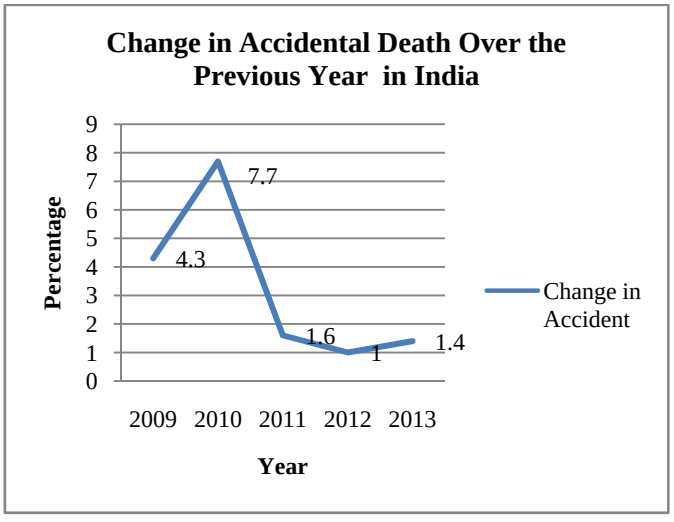

Fig. 2: Data for Minimization of Accident

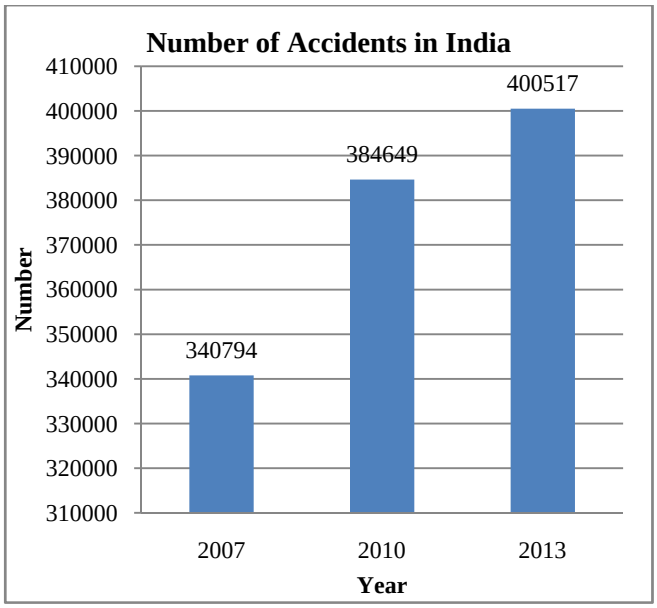

Fig. 3: Accidents in India

- Fuel Consuming- the public transport system made the optimum use of the road space and transportation fuels. It is responsible for reducing the pollution emitted from vehicle including green house gases. Similarly mass rapid transit system is responsible for minimum use of natural energy resources. It is electricity based transportation system which is non-site emitted.

Table 3: Annual Run and Fuel Consumption Norms

Traffic Mode	Diverted Traffic	Fuel Consumption Norm	Daily Run	Fuel Savings
Cars	164252	13	30	138350586
two-wheelers	985789	35	25	257009274
Buses	9450	18	209	39651154

Source:Social Cost Benefits Analysis, IEG Delhi.

As per my thought, there are mainly two type of mass rapid transit system based on the path, i.e. rail and bus. Bus rapid transit system is the bus based mass rapid transit system. Further rail based MRTS categorized in few types manually operated and fully auto mated, than manually operated is classified as Underground (Metro Rail), On Surface (Suburb Train) and Elevated (Monorail), Than Underground or metro rail which may be run on surface also can be divided into three types:-

- High Capacity Rail Transit System
- Medium Capacity Rail Transit System
- Light Rail Transit System

Types of MRTS

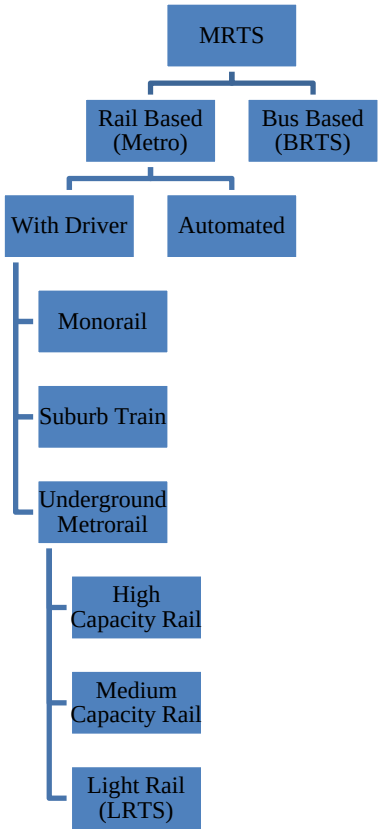

Fig. 4: Types of MRTS

3. HISTORY

London underground id the first metro rail or rail based rapid transit system which starts in January 1863 between Paddingdon to Ferringdon. This system had steam engine and wooden carriage. Although its idea came in 1830 but granted permission to start the work in 1854. It had a great success declared in two days only because it carriage 38000 passengers on the opening.

Than in 1875 first British metro starts with the company, "The metropolitan railway of Constantinople to the Galalta Pera.

In USA, oldest subway tunnel is in Boston (1897). New York City has largest four track line of 14.5 Km length in the world. Madrid metro was opened on 17 Oct 1919, which is now one of the largest metro system in the world. In 1924, Barcelona metro starts.

Moscow credited for the first metro-rail in USSR, which opened in 1935. Moscow metro is now the busiest metro system in the world. After that automated (without ATO) metro rails were start.

In between Toronto, Montreal and Brazil starts the metro on 1954, 1966 and 1974 respectively.

In Asia, Tokyo is the first city for opening the metro (1927), Osaka is the second (1933). Later on Beijing (1969), Hongkong (1974), Singapore, famous for heavy rail system (1987), Taiwan (1996), Iran (1999), UAE (2009) and Saudi Arabia (2011) were noticed for using the metro rail.

4. MRTS IN INDIA

First metro rail is Kolkata metro (1984), than Delhi (2002) and Gurgaon (2013). After success of these metro now five more cities starts work for built this MRTS system, like Mumbai, Hyderabad, Banglore, Chennai and Kochi.

Some facts about the first metro rail in India i.e. Kolkata metro rail:-

- India's 1st and Asia's 5th metro rail was introduced in Kolkata.
- Over a length of 16.45 km and the work on this project was sanctioned on 1.6.1972
- The construction work started in 1973-74.
- After crossing so many hurdles Calcutta Metro started its journey on October 24, 1984
- Air-conditioning and ventilation system for environmental control of stations and tunnels.
- Automatic ticket vending and checking system.
- Automatic door opening / closing .
- A public address system is provided on the trains to announce approaching stations.
- System length - 22.3 km
- Number of lines – 2
- Number of stations - 21 (15 underground, 1 on surface and 5 elevated)
- Track gauge - Broad Gauge
- Coaches per train - 8
- Maximum permissible speed - 55 km/h
- Average speed – 30km/h
- Voltage - 750 V D.C.
- Travel Time - 41 minutes (approx.)
- Total estimated cost of the project - Rs. 1825 Crores (approx.)

5. FINDINGS/CONCLUSION

Metro systems are more reliable, comfortable and safer than road based systems & it reduce congestion on the roads. However systems planned in India shows that cost overrunning and under utilization of capacity. Methodology and arguments used to justify these systems needs careful analysis. High capacity system does not necessarily generate high demand. Estimation of passenger demand for transit services should consider complete journey of commuters including access time.

As we saw that mass rapid transit system from parringdon to delhi continuously appreciated. Similarly BRTS in all over the world is appreciated. It minimize the travel time, GHG

emission, traffic accidents, fuel consumption. The benefits of MRTS can be categorize like this:-

- Requires 1/5th energy per passenger km compared to road-based transport system.
- Causes less noise, no air pollution and eco friendly transport system.
- Occupies no road space if underground and only about 2.60 meters width of the road if elevated.
- Reduces journey time.
- Cost effective mass transport system.
- Reducing traffic transport problems.

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